GIAC GPS Interagency Advisory Council

April 30, 1999

MEMORANDUM FOR: Colonel Richard Skinner, USAF
Principal Deputy Assistant Secretary of Defense
(C3ISR and Space Systems)

Joseph F. Canny
Deputy Assistant Secretary for Transportation Policy
Department of Transportation

FROM: Charles W. Challstrom
Chair, GPS Interagency Advisory Council

SUBJECT: Implementation of the Third Civil GPS Signal

This memorandum provides input to the Interagency GPS Executive Board (IGEB) Senior Steering Group (SSG) for Third Civil GPS Signal Implementation and its working groups on behalf of the GPS Interagency Advisory Council (GIAC).

With regard to the study of potential interference of various systems and the third signal at 1176.45 megahertz (MHz), GIAC members note that the aviation requirements are so stringent that almost all Federal civilian non-transportation use of the third signal will be adequately protected if aviation requirements are met. This is based, in part, on information contained in the U.S. Radiocommunications Sector Fact Sheet, Document No: US-WP8D/12, 6 March 1999. This document identifies an integrity requirement for vertical navigation sensor error of one event per 500,000,000 Category-III approaches. Given the spatial extent of an airport approach, and the number and distribution of airports within the United States, this aviation risk criterion should serve for the operation of geodetic and timing GPS receivers.

I must caution, however, that current and future civil applications cannot always be measured by aviation requirements. This was illustrated in the recent Chief Executive Officer Roundtable, held at the Department of Commerce in December 1998, GPS has major impact on the agriculture, automotive, aviation, banking, communications, construction, lumber, shipping, space systems, surveying, and transportation sectors. In this meeting it was pointed out that "accuracy is addictive." In many cases, this accuracy will be obtained by use of various widelane combinations of the carrier phase on all three GPS frequencies, and will be at the level of just a few centimeters.

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For example, the National Oceanic and Atmospheric Administration has been engaged in a demonstration project where the keel of a ship has been positioned to within a few centimeters relative to the underwater hydrography. This technology will enable increased throughput, higher profits, and greater safety of shipping operations in our Nation's ports and harbors. One can conceive of a future scenario where an interference source could be controlled for aviation through operational or procedural protocols such as scheduling or routing. Such a solution may work for aviation, but may not mitigate the problem for precision shipping and land transport.

Further, GIAC understands that IGEB SSG Working Group 1 (Feasibility of Coexistence) prepared to recommend to the National Telecommunications and Information Agency that no frequency allocation exceptions be granted for systems incorporating Ultra Wide-Band radar (UWB) at this time. We endorse this recommendation, since low power UWB systems may be situated in close proximity to both transportation and non-transportation applications of GPS. Resolution of this potential interference issue will likely require studies and field tests prior to any licensing activity for this system.

Based on reports by GIAC representatives to the Working Groups, GIAC endorses the proposed hybrid signal structure. It has superior characteristics due, in part, to placing data messages on one channel, and the carrier on a different channel. This will allow carrier phase tracking under adverse levels of interference that would prevent receipt of the data message. The proposed hybrid signal structure appears to be a very robust choice for precision positioning applications.